Stopping: $v^2 = u^2 + 2as$

$0 = (40)^2 + 2(-2)s$

$s = 400$ m

$\therefore$ It will travel a further $400 - 111 = 289$ m

Q. 10. a to b: $s = ut + \frac{1}{2}at^2$

$20 = u(5) + \frac{1}{2}(a)(5)^2$

$2u + 5a = 8$

a to c: $40 = u(8) + \frac{1}{2}a(8)^2$

$2u + 8a = 10$

Solving these gives $u = \frac{7}{3}$ m/s, $a = \frac{2}{3}$ m/s^2

a to d: $a = ut + \frac{1}{2}at^2$

$60 = \frac{7}{3}t + \frac{1}{2}\left(\frac{2}{3}\right)t^2$

$t^2 + 7t - 180 = 0$ (use formula)

$t = 10.4$ s (-17.4 is rejected).

The time taken $= 10.4 - 8 = 2.4$ s

Q. 11.

Area $= \frac{1}{2}(10)x + 32x + \frac{1}{2}(6)x = 1{,}000$

$x = 25$ m/s

Distances are: $\frac{1}{2}(10)(25) = 125$;

$32(25) = 800$;

$\frac{1}{2}(6)(25) = 75$ m

Q. 12. (i) $t_1 : t_2 = 3 : 1 = \frac{3}{4} : \frac{1}{4}$

$\therefore t_1 = \frac{3}{4}(20) = 15$ s

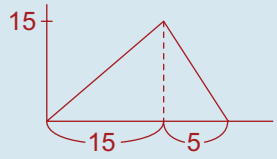
$\therefore t_2 = \frac{1}{4}(20) = 5$ s

(ii) $v = u + at$

$v = 0 + (1)(15)$

$= 15$ m/s

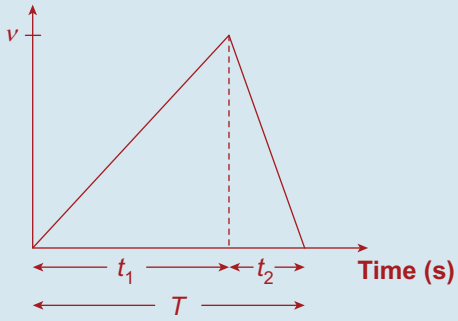
(iii)



$s =$ Area under curve

$= \frac{1}{2}(20)(15) = 150$ m

Q. 13.



Let the top speed $= v$

$t_1 = \frac{v}{2}$

$t_2 = \frac{v}{7}$

The time taken $= 90$ seconds $= T$

$T = \frac{v}{2} + \frac{v}{7} = \frac{7v + 2v}{14}$

$= \frac{9v}{14}$

$\frac{9v}{14} = 90$

$9v = 1{,}260$

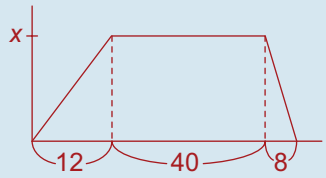
$v = 140$ m/s

Distance $= \frac{1}{2}(90)(140)$

$= 6{,}300$ m

$= 6.3$ km

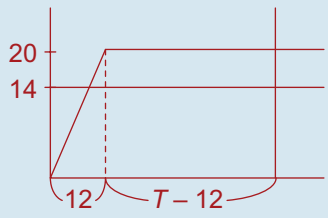
Q. 14. (i)



Area $= \frac{1}{2}(12)x + 40x + \frac{1}{2}(8)x = 1{,}000$

$x = 20$ m/s

(ii)



$\text{Area}_1 = \text{Area}_2$

$14T = \frac{1}{2}(12)(20) + 20(T - 12)$

$T = 20$ s

$s = 14T$

$= 280$ m